VW Settlement – Comments Received

Last Update: January 3, 2016

Contents

Comment #1 - Greater New Haven Clean Cities Coalition, Inc.

Date Received: 12-03-2016
Name: Lee Grannis
Job Title: Coordinator
Company: Greater New Haven Clean Cities Coalition, Inc.

Comments: My coalition's comments are focused on the Department of Justice Consent Decree, Appendix D2 (Eligible Mitigation and Actions and Mitigation Action Expenditures). We are listing our suggested priority for the listed actions. Since a significant amounts of funding has already been designated for the light duty electric vehicle sector as part of the agreement we believe the medium to heavy duty transportation sector should be focused on by the state for this funding. Below is the priority from Appendix D-2, we believe would achieve a greater level of NOx (Oxides of Nitrogen) and GHG (Green House Gas) reduction to include, achieving a better return on investment (ROI) and environmental justice benefits. The GNHCCC request that private fleets, companies and organizations get the priority for the funding over state and municipal organizations because they drive more miles over greater areas and emit more NOx, criteria emissions and GHGs then municipal and government vehicles. There is one exception to this and that is Section 2 vehicles, which includes school buses, shuttle buses, and transit buses. School buses are our number one priority, being both privately and school owned and operated. Shuttle buses should be awarded funding based on miles driven making them excellent systems for propane, natural gas power and hybrid trains. Transit buses are mostly municipal operations and are excellent platforms that can use alternative fuels to reduce significant amounts of NOx.

Priority 1. Section 2-Class 4-8 School Bus, Shuttle Bus and Transit Bus (Eligible Buses).

Several school districts are already considering propane/autogas school buses as well as currently deploying them. The new school bus propane/Autogas engine technology makes them a good fit both in terms of emission reduction, cost and operational efficiency. In addition many children have a variety of childhood health issues that propane/Autogas powered buses mitigate by providing a clean breathing environment, and have no emission generated particulates. Because of the economics of propane/Autogas fuel, and the related ease of infrastructure deployment this has made these propane/Autogas powered buses the best use of the funding. More specifically the most popular school bus propane engines will be certified at 0.05 grams of NOx per brake horsepower-hour (g/bhp-hr), which is 75% cleaner than today's cleanest diesel school buses. Since school buses get 100 % funding under the settlement, this is an excellent use of the funding for local schools and Connecticut tax payers.

Propane/Autogas and CNG (Compressed Natural Gas) fueled alternative fuels used in shuttle buses is very advantageous in the terms of NOx, GHG and other criteria emission reduction, return a better return on investment (ROI), achieve noise reduction, better operational/maintenance efficiency and environmental justice benefits. The same health issue that effect children on school buses applies to senior population that use the transit and paratransit buses, and is mitigated by the use of clean propane/Autogas and CNG.

This section allows for the use of transit buses to deploy new EV powered transit buses. Electric buses that exceed all other powered buses in terms of "Made in the USA" are available in fast charge and long range electric bus versions for deployment along traditional transit bus routes should be a priority use of the funds. These buses have all the emission reduction advantages that

light duty vehicles have, plus helping to reduce the number of single occupancy gasoline powered vehicles on the road. This funding could be made available to municipal transit agencies and private companies to defer the higher capital cost of these vehicles as an example. Connecticut needs to start running electric transit buses on the road in order to address the heavy duty electric vehicle charging challenges, as well as giving the utilities and regulators a bench mark to determine their requirements related to providing heavy vehicle charging. CT DOT has been trying to find the funding to deploy electric transit buses with little luck, and this would be a great way to get the funding to deploy these buses.

Priority 2. 1. Local Freight Trucks and Port Drayage Trucks (Eligible Larger Trucks

Class 8 especially private companies have not been offered any funding assistance in years, except by Clean Cities grants. Congestion Mitigation and Air Quality (CMAQ) from the Federal Highway Administration (FHWA) funding has been withheld from private companies by the state since the 1990s, even though it is allowed by CMAQ federal rules. This section allows funding for a sector of vehicles like CNG heavy duty vehicles, which travel a lot more miles than a government/municipal vehicle. NOx and GHG would be reduced more per vehicle, especially in our state, which is not in attainment for ozone, and trying to maintain the PM2.5 attainment maintenance status which would be easier to achieve by using this fuel. There are three refuse companies deploying CNG heavy duty trucks in central Connecticut and attempting to expand their fleets. The infrastructure is available to support these type vehicles in several parts of the state, and this funding would stimulate the growth of more CNG refuse/trash vehicles by more companies and municipalities deploying the technology.

Priority 3. 6. Class 4-7 Local Trucks (medium)

This section is our third choice and lends itself to propane/Autogas powered vehicles. This could be in the form of dedicated or bi-fuel (gasoline & Propane) trucks. These trucks are usually in the form of box trucks making the last mile delivery to small and midsize stores. They may also be in the form of vehicle delivering work clothes, hospital or hotel linen, or even potato chips. These vehicles operate in around buildings that are in congested areas, to include schools and medical facilities. These are areas that NOx accumulation can stimulate an unhealthy ozone levels as well as adding to noise pollution. Propane can reduce a whole host of unhealthy criteria emissions as we as cutting NOx, GHG as well as reducing reduce noise levels. If and when creditable electric trucks in this category are available in any quantity, they would be an excellent choice when deployed, but because of their premium cost, which can be twice as much as a propane powered vehicle, the funding will be needed. CNG vehicles can be an excellent choice if fueling infrastructure is near to the fleet garage facility. Either CNG or propane/Autogas power vehicles provides an option that alleviates the maintenance issues, and down time associated with the maintenance intensive diesel regeneration requirement on today's diesel vehicles.

Priority 4. 8. Forklifts

Forklifts are listed in this section listing them as electric eligible. We think that the newly emerging fuel-cell forklift technology is a viable choice. It is a non-road electric vehicle with a fuel-cell axillary power unit to charge it. Many of the large companies like Wal-Mart are starting to use fuel-cell powered forklifts due to their predictability of full run time. Batteries can run out of operating power without notice, and do require time consuming battery exchanges. The fuel-cell forklift industry has gained popularity over the last few years, because of how they operate and lower vehicle costs. From industry reports the big box company warehouses are increasingly turning to fuel-cell forklifts, and we see no reduction in their deployment. Hopefully they will have to be allowed under this category.

Priority 5. 7. Eligible Airport Ground Support Equipment

We support deploying most All-Electric powered equipment as long as it makes economic and operational sense. Replacement of older electric equipment that is not maintaining required operational efficient and has safety concerns might be considered.

Priority 6. 9. Light Duty Zero Emission Vehicle Supply Equipment

We support EVSEs especially Fast Charger on major vehicle corridors easily assessable to the public. In the case of hydrogen infrastructure, we believe that incentive support will be essential to support the high cost of the systems. This is an excellent opportunity to try multiple technologies that produce sustainable hydrogen if allowed.

Priority 7. 10. The GNHCCC is supportive of Freight Switcher, Ferries/Tugs and Ocean Going technologies listed in other sections, and reducing their NOx profile. The Clean Cities program does not include these technologies in their list of technologies, and we do not focus as much on them. We think these technologies and industry sectors are important, and should be considered for funding if applicable.

Comment #2 - Bridgeport Port Authority

Date Received: 12-08-2016
Name: Martha Klimas
Job Title: Project Manager
Company: Bridgeport Port Authority

Comments: Question – would replacement of an on road diesel truck used to transport equipment for dive (search and rescue) teams be eligible under this opportunity? The vehicle is older (>20 years old) and its primary use is to move equipment to “incident” locations (waterfront) within the State.

Comment #3 - School Lines, Inc., North Branford, CT

Date Received: 12-08-2016
Name: David Lintern
Job Title: President
Company: School Lines, Inc., North Branford, CT

12/8/2016

CT DEEP Commissioner
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
Re: Using Volkswagen Settlement Funds to fund propane-fueled school buses

Dear Commissioner,

On October 25, 2016, the U.S. Department of Justice entered into a partial settlement with Volkswagen that will result in Connecticut receiving $51,635,237., which must be used to implement projects that reduce smog-forming nitrogen oxide ("NOx") emissions (the "Volkswagen Settlement Funds").[1] This represents a tremendous opportunity to support local businesses and school districts in accelerating the clean-up of older, pre-emission diesel buses in Connecticut, especially in communities that have been disproportionately burdened by these vehicles.
North Branford, CT, I write to recommend that the CT DEEP, as part of its potential role as Beneficiary, implement programs that increase the use of propane school buses because they offer a cost-effective strategy to reduce NOx emissions and improve public health. School Lines, Inc. would like to support your efforts, with the assistance of our partnership with ROUSH CleanTech, which has helped deploy over 9,500 propane-fueled buses in more than 650 school districts nationwide.

Propane school buses can be a smart investment for Connecticut. Our propane school bus customers, developed through our 25 years of alternative fuel experience, have seen tremendous benefits, including fuel cost reductions of 60 percent per gallon and operations and maintenance savings of $0.37 per mile, as compared to diesel.[2] Propane school buses can thus support the CT DEEP's efforts to achieve cost-effective NOx emissions reductions.

Propane-fueled school buses exist today that are much cleaner than even the cleanest diesel school buses. In fact, starting with model year 2017, we will offer the propane-fueled Vision Type C school bus, in partnership with ROUSH CleanTech and Ford Motor Company. This bus will be certified at 0.05 grams NOx per brake horsepower-hour (g/bhp-hr), which is 75 percent cleaner than today's cleanest diesel buses.[3] What's more, these new propane school buses will be 99 percent cleaner than the oldest, dirtiest buses still operating in many of our state's school districts.[4]

[1] United States, In Re: Volkswagen "Clean Diesel" Marketing, Sales Practices, and Products Liability Litigation. Order Granting the United States' Motion to Enter Proposed Amended Consent Decree, MDL No. 2372 CRB (JSC). http://www.cand.uscourts.gov/crb/vwmdl, October 25, 2016.
[2] "Propane Testimonials." Blue Bird. http://www.blue-bird.com/blue-bird/propane-testimonials.aspx.
[3] For model year 2010 and newer diesel engines, EPA established a NOx emission standard of 0.2 g NOx / bhp-hr. Please refer to EPA's summary table of diesel engine exhaust emission standards for further detail.
[4] For model year 1998 to 2003 diesel engines, EPA established a NOx emission standard of 4.0 g NOx / bhp-hr. Please refer to EPA's summary table of diesel engine exhaust emission standards for further detail.

Propane buses also significantly reduce children's exposure to emissions that are associated with increased asthma emergencies, bronchitis, and school absenteeism, especially among asthmatic children.[5] Propane school buses effectively eliminate diesel particulate matter emissions that are associated with cancer and thousands of premature deaths nationwide every year. These vehicles are also a safe transportation solution because propane is non-toxic, non-carcinogenic and non-corrosive, and because their vehicle fuel tanks are 20 times more puncture-resistant than gasoline or diesel tanks.[6]

School Lines, Inc. would like to work with you and your team to ensure the most cost-effective and environmentally beneficial use of CT's Volkswagen Settlement Funds. Towards that end, we request that CT DEEP implement programs that increase the use of propane school buses.

Thank you for considering our request. We look forward to continued dialogue with you and your team, and to a future collaboration that will help Connecticut meet its air quality goals.

Sincerely,

David Lintern
President
School Lines, Inc.
203-488-1382
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cc: Dannel P. Malloy

Comment #4 - Plug In America

Date Received: 12-20-2016
Name: Katherine Stainken
Job Title: Policy Director
Company: Plug In America

To Whom it May Concern:

Attached please find comments from Plug In America on Appendix D of the VW Settlement. Plug In America is the leading non-profit representing the current and future EV driver across the nation.

If you have any questions, please do not hesitate to contact me. We look forward to working with you!

Thank you!

<Attachment Below>

[5] Adar, S. et al. "Adopting Clean Fuels and Technologies on School Buses. Pollution and Health Impacts in Children." ATS Journals, Volume 191, Issue 12. http://www.atsjournals.org/doi/abs/10.1164/rccm.201410-1924OC#.WA-HlNUrJhE, June 15, 2015.
[6] "Propane Autogas – Safe and Reliable." Blue Bird. https://www.blue-bird.com/blue-bird/Propane-is-safe.aspx.

Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

December 6, 2016

Re: Comments on Appendix D of the VW Settlement

To Whom it May Concern:

Thank you for the opportunity to provide comments on Appendix D (Form of Environmental Mitigation Trust Agreement) of the Consent Decree of the VW Settlement. Appendix D requires the Settling Defendants to pay a total of $2.7 billion to fund Eligible Mitigation Actions that will reduce emissions of NOx where the 2.0 Liter Subject Vehicles were, are, or will be operated.[1] The funding also allows for each Beneficiary to use up to fifteen percent (15%) of its allocation of Trust Funds on the installation of new light-duty zero emission vehicle supply equipment, including electric vehicle charging infrastructure.

Plug In America is the national consumer voice for plug-in electric vehicles (PEVs) and works to promote policies and programs nationwide that put more PEVs on the road.[2] Our members are passionate PEV advocates and have driven PEVs for many years, affording Plug in America a unique perspective on how consumers think about PEVs and what actually inspires a consumer to purchase a PEV.

Though the circumstances that resulted in the VW Settlement are extremely unfortunate, we are enthused to see that VW must invest $2 billion over 10 years on Zero-Emission Vehicle (ZEV) programs under Appendix C. Likewise, we are encouraged that 15% of the settlement funds for each Beneficiary under Appendix D may be spent on electric vehicle charging infrastructure. The PEV market is quickly growing, but needs additional support to achieve the national goal for PEVs of 1 million PEVs on the road by 2020.

From 2010 to November 2016, consumers have purchased more than 534,000 cars,[3] with sales expected to accelerate as new vehicle makes and models become available, such as the Chevy Bolt.[4] In California alone, the state has gone from about 10,000 total PEVs on the road in 2012 to more than 117,000 battery electric vehicles (BEVs) and 111,000 plug-in hybrid electric vehicles (PHEVs) on the road, for a

[1] See page 5 of the Amended Consent Decree: https://www.epa.gov/sites/production/files/2016-10/documents/amended20lpartial-cd.pdf
[2] More information available at: www.pluginamerica.org
[3] Vehicle count based on HybridCars.com count of U.S. sales of 523,525 plug-in vehicles (BEVs, PHEVs) from December 2010 through the end of October 2016.
[4] More on the Chevy Bolt can be found at: http://www.chevrolet.com/bolt-ev-electric-vehicle.html

total of 228,000 PEVs in California.[5] More and more drivers nationwide are making the switch to drive electric simply because PEVs are convenient and save consumers money.

We respectfully offer the following comments on Appendix D of the Consent Decree:

1. We encourage Connecticut to develop a Beneficiary Mitigation Plan as outlined in Appendix D, and apply for the full funding allocated to Connecticut as stated in Appendix D-1 Initial Allocation of the Amended Consent Decree.[6]

As stated in the Amended Consent Decree, "Not later than 90 Days after being deemed a Beneficiary pursuant to subparagraph 4.0.2.1 hereof, each Beneficiary shall submit and make publicly available a "Beneficiary Mitigation Plan" that summarizes how the Beneficiary plans to use the mitigation funds allocated to it under this Trust."[7] We urge Connecticut to develop a Beneficiary Mitigation Plan that fully utilizes the amount of funding allocated to the state.

2. Of the allocation of Trust Funds that may be used for the installation of zero emission vehicle supply equipment, we urge that Connecticut use the full 15% on electric vehicle charging station projects.

Under item 9 of Appendix D-2, Eligible Mitigation Actions and Mitigation Action Expenditures, the Amended Consent Decree states, "Each Beneficiary may use up to fifteen percent (15%) of its allocation of Trust Funds on the costs necessary for, and directly connected to, the acquisition, installation, operation and maintenance of new light duty zero emission vehicle supply equipment for projects as specified below."[8]

The PEV market is ready to expand, yet needs significant deployment of charging infrastructure. Investing in charging infrastructure should be prioritized for the multiple benefits from PEVs that accrue to all citizens, regardless of who may purchase the car or the type of PEV purchased.

From the consumer perspective, more and more drivers are making the switch to drive electric simply because PEVs are convenient and save consumers money. There's no trip to the gas station needed, and the battery can be charged overnight and be ready to go first thing in the morning. In addition,

[5] http://www.zevfacts.com/sales-dashboard.html
[6] See Appendix D-1 of the Amended Consent Decree: https://www.epa.gov/sites/production/files/2016-10/documents/amended20lpartial-cd.pdf
[7] Ibid.
[8] Ibid.

maintenance for PEVs costs much less than for gasoline vehicles.[9] On average, fueling a car with locally produced electricity is roughly the same as fueling with gas at $1 per gallon, thanks to a PEV's performance efficiency and the lower cost of electricity.[10] Electricity prices are also far more stable than gasoline prices, allowing drivers to avoid the risk of future price spikes.

PEVs are also more cost-effective than gas-powered vehicles. Should gas prices hover at the recent summer price of $3.50 per gallon, the average electric vehicle will save its owner nearly $9,000 over the vehicle's lifetime, which is a significant amount for the driver in the middle class.[11] As PEVs are fueled from electricity from the local grid, which is cheaper for all consumers, money not spent on gas or on maintenance can be invested back into the local economy, especially in the inner cities.[12] Furthermore, these vehicles promote national security by heavily reducing our dependence on oil and imported fuels, as the electricity is produced domestically and locally.

There is also significant job creation potential with the acceleration of the PEV market. Currently, the U.S. manufactures PEVs and other advanced technology vehicles and components in at least 20 states, creating thousands of new, good jobs.[13] The PEV market keeps America competitive with countries such as China, which is moving aggressively towards electrification of their transportation sector.

Therefore, the full 15% of Trust Funds that may be used for the installation of zero emission vehicle supply equipment should be spent on electric vehicle charging infrastructure.

3. **With regards to the types of charging infrastructure that may be installed, we urge Connecticut to consider the driver perspective and prioritize the installation of the electric vehicle charging infrastructure in the following order: L1 and L2 at homes and workplaces, DCFC and finally L2 in other public places.**

We recommend that the various types of charging stations to be installed be prioritized to reflect actual PEV driving behavior. The first point to consider is that most charging, around 85%, occurs at home.

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[9] Plug In Hybrid Electric Vehicles (PHEVs) require fewer oil changes, while Battery Electric Vehicles (BEVs) require none. PEVs also have 10 times fewer moving parts than gasoline vehicles; there's no engine, transmission, spark plugs, valves, fuel tank, tailpipe, distributor, starter, clutch, muffler, or catalytic converter.

[10] http://energy.gov/eere/eveverywhere/ev-everywhere-saving-fuel-and-vehicle-costs

[11] The analysis was performed by Environment California in the report, "Drive Clean and Save: Electric Vehicles are a Good Deal for California Consumers and the Environment." However, similar incentives are already in place in dozens of other states across the country, and gas prices are similar in dozens of other states as well, suggesting a similar result in savings for other states. The report is available here: http://www.environmentcalifornia.org/sites/environment/files/reports/Drive%20Clean%20and%20Save%20June%202016.pdf

[12] Roland-Holst, David. 2012. Plug-in Electric Vehicle Deployment in California: An Economic Assessment https://are.berkeley.edu/~dwrh/CERES_Web/Docs/ETC_PEV_RH_Final120920.pdf and Stroo, Hans. 2015. Bills to Advance Electric Vehicles Make Good Economic and Environmental Sense http://planwashington.org/blog/archive/bills-to-advance-electric-vehicles-make-good-economic-and-environmental-sense/

[13] http://sierraclub.typepad.com/compass/2012/06/fuel-economy-jobs.html

Even as we consider the future of PEV charging, it is likely that most drivers will choose to charge at home in order to maintain the most control over when the vehicle is charged. The next place consumers will choose to charge is at the workplace, where vehicles will typically spend 8 or more hours parked, representing a perfect opportunity to charge. This is especially important for those people living in multi-unit dwellings (MUDs) who may not be able to charge at home. The second point to consider is that 93% of drivers commute less than 35 miles one way to work each day.[14]

With these two considerations of PEV charging behavior in mind, it's next important to evaluate the types of charging available. Charging stations come in a variety of power levels which fall into three basic categories by increasing charge speed: Level 1, Level 2 and DC charging. While faster charging is generally preferable, slower charging can be less expensive and serve more vehicles. The best power for a given installation depends on how much charge the target users will need and how long they will want to stay at the charging location, their "dwell time." As noted above, employee vehicles at the workplace will typically be parked for 8 hours.

Since the average commute is around 35 miles per day one way, and the current size of batteries can support a drive to the workplace and back on a single charge, Level 1 charging stations at the workplace become an attractive option. Level 1 is AC charging at 120V, the level of power that is supplied by a normal household outlet. This will supply 3 to 5 miles of range per hour to a typical electric vehicle, or up to 40 miles of range for an 8-hour connection during a typical work day. That's enough to replenish the charge for the majority of U.S. drivers.

Level 1 charging can be implemented with a simple outlet on a dedicated 15A or 20A circuit, with GFCI if outdoors. In that case, the driver is required to use the charging cable that comes with all PEVs, to connect the vehicle to the outlet. This can be a hassle for the driver, having to expose a $300 - $600 charge cable to a dirty environment and potential theft, depending on the location.

A more convenient way to implement Level 1 charging is with a charging station. Although marginally more expensive than a regular outlet, the additional expense is small when amortized over the lifetime of the installation and compared to the cost of electricity dispensed. A Level 1 charging station is more convenient and more secure for the PEV driver. Stations equipped with multiple charge ports combined with proper positioning of the station can serve multiple parking spaces in a variety of facilities (e.g., garage, open lot and curbside).

Plug In America sees a major opportunity for the widespread use of L1 charging at workplaces, homes and MUDs. A recent report from the U.S. Department of Energy also explored how L1 charging can

[14] Source: U.S. Department of Transportation, Bureau of Transportation Statistics, Omnibus Household Survey (2014)

provide a successful workplace charging solution.[15] Prioritizing charging at the workplace will help speed adoption of these clean vehicles. Studies show that employers with charging stations have employees who are 20 times more likely to buy an electric vehicle.[16] Furthermore, L1 charging at the workplace may be more desirable over L2 in the long run in order for the vehicle to provide grid services over a longer dwell time.

Following L1 and L2 charging at homes, workplaces and MUDs, DC Fast Charging (DCFC) stations should be installed, particularly where concentrations of PEV drivers live in MUDs without access to garage based home charging. In addition, siting DC Fast Chargers at locations along highway corridors approximately 50 miles from urban PEV concentrations will be advantageous for range extension opportunities.

The installation of DCFC stations are higher upfront investments than some small workplaces and MUDs can likely afford. Therefore, investment in DCFC should be supported by the VW Settlement funds available under Appendix D. These DCFC should be located along the recently designated PEV Corridors.[17]

With third party charging companies very active in promoting L2 in many public places, it is critical to keep PEV driving behavior in mind in determining which infrastructure to invest in and install. This will avoid costly investment in charging stations at locations where the stations are underutilized and unnecessary.

4. **Consumer protection principles should be adhered to for all electric vehicle charging infrastructure installed.**

The total sum of funds available for investment in electric vehicle charging infrastructure through Appendix C and D is more than has ever before been publicly available for investment in the sector. Plug In America urges the Connecticut to include the below consumer protection issues as part of any PEV charging station project:

a) *Open Access* – This is defined as the ability to get a charge at any public charger - including L1, L2 and DCFC - either via a credit card swipe or mobile app to enable the charge. PEV drivers should never be stranded at a public charging location where they cannot actually charge.

b) *Transparency* – The price of a charge should be clear when the PEV driver connects to the charger. This price should also be reported in mapping API so that drivers can select a charging station even before they reach a charging station.

[15] http://energy.gov/sites/prod/files/2016/07/f33/WPCC_L1ChargingAtTheWorkplace_0716.pdf
[16] http://www.energy.gov/eere/articles/survey-says-workplace-charging-growing-popularity-and-impact
[17] The Alternative Fuels Corridors can be found here: http://www.fhwa.dot.gov/environment/alternative_fuel_corridors/

c) *Interoperability* - This is a key principle for the entire charging infrastructure ecosystem. Currently, many companies have their own card or key, which means drivers must either join multiple "clubs" or risk being unable to charge. There's no need for a separate system of payment specific to charging stations other than the standard methods of payment used in everyday financial transactions today, such as credit cards, ApplePay, etc.

d) *Mapping data* - All electric vehicle service providers (EVSPs) should provide mapping data for charging locations, including costs for charging (both in and out of network). Charging station locations should be provided regardless if the charging station is part of a larger EVSP network or a stand-alone single public charging station.

e) *Signage* – There is a critical need for charging station signage, from highway visibility down to the last several hundred feet where the charging station is. While the charging station may be listed on a smartphone, car navigation, or web-based maps, the stations are still challenging to locate as the physical hardware is not that large. Directional signage installed on streets around the stations would help immensely, and also reduce consumer range anxiety. Furthermore, signage can play a huge role in familiarizing non-PEV drivers with the ubiquity of the charging stations.

We would be happy to discuss these recommendations further with you. Please send any questions to Katherine Stainken, Policy Director, at kstainken@pluginamerica.org. We thank you for this opportunity to provide comments on Appendix D of the Consent Decree of the VW Settlement, and look forward to working with you.

Best regards,

Joel Levin
Executive Director
Plug In America

Comment #5 - Sierra Club

Date Received: 12-22-2016
Name: Joshua Berman
Job Title: Staff Attorney
Company: Sierra Club

Connecticut Dept. of Energy & Envtl. Protection
79 Elm Street
Hartford, CT 06106
Email: deep.mobilesources@ct.gov

RE: Comments of the Sierra Club Regarding Use of Volkswagen Partial Consent Decree Environmental Mitigation Trust Funding for the Purpose of NOx Emissions Reductions in the State of Connecticut

On behalf of the Sierra Club and its more than 8,000 members in Connecticut, we respectfully submit the following comments regarding the use of funding allocated to the State of Connecticut through the Volkswagen Partial Consent Decree Environmental Mitigation Trust (Mitigation Trust). Volkswagen's installation of defeat devices on diesel vehicles sold in Connecticut resulted in emissions of nitrogen oxides (NOx) from these vehicles that exceeded limits established under the Clean Air Act by up to 3,400%. As a primary component of ground-level ozone (smog), as well as a source of fine particulate matter and acid rain, the excess NOx emissions contributed to diminished air quality levels in Connecticut and impeded the State's efforts to bring its air quality into attainment of health-based National Ambient Air Quality Standards for ozone. The funding provided in the Mitigation Trust is intended to support programs that mitigate and reduce emissions of NOx. To maximize the emission reductions that can be achieved using the Mitigation Trust funding allocated to Connecticut we offer the following recommendations:

(1) Connecticut should allocate the maximum amount authorized by the settlement (15% of total state funding) to programs designed to expand access to electric vehicle (EV) charging in the State. Light-duty vehicles are the single greatest contributor of NOx emissions in Connecticut.[1] Electrification of the vehicle fleet is the most effective way to mitigate emissions from this source category. And access to electric vehicle charging is a key barrier that must be overcome in order for EV adoption in Connecticut to rapidly expand. We recommend that the charging infrastructure investments target access to fast chargers on major highways (including those recently designated as EV corridors), and charging infrastructure to multi-unit dwellings and workplaces with a focus on ensuring that benefits redound to disadvantaged communities.

(2) For the remainder of the funds, Connecticut should prioritize electric trucks, buses, and port vehicles. Indeed, heavy duty road vehicles are the second and third largest contributors of NOx pollution in the state. Specifically, the Sierra Club recommends

[1] https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data.

spending the remaining funds on electric transit buses and electric school buses and providing funding for electric drayage and forklifts at ports. These investments will most benefit low-income communities and communities of color who disproportionately bear the burden of air pollution. Vehicle electrification benefits will only grow as the electricity used to power them continues to become cleaner. Specifically, Sierra Club strongly recommends NOT using the funds to invest in new diesel or natural gas vehicles. These investments would lock us into many more years of using fossil fuels dangerous for our air quality and climate stability. Additionally, while electric vehicles and equipment may have higher up-front costs than their diesel counterparts, they typically have lower maintenance costs and can be highly cost-effective on a life-cycle basis. These lower maintenance costs are particularly relevant to the extent they are not covered by settlement funds.

Consistent with the above recommendations, we believe the Mitigation Trust funds have the opportunity to advance Connecticut's environmental justice goals and should be targeted in a manner that will do so. CT DEEP's Environmental Equity Policy, established in 1993, explicitly demands that no Connecticut resident should disproportionally bear the impacts of pollution due to race or economic status. To support this goal, the Public Act No. 08-94 identifies environmental justice communities throughout the state and ensures they have ample access for meaningful public participation when new polluting facilities propose to build in these communities. As discussed in these comments, people of color in Connecticut bear a disproportionate share of the NOx-driven ozone pollution in the state and Connecticut's five major cities are home to over half of the State's population in poverty. Funding from the Volkswagen Settlement can support the state's goals of cleaning up the air in these areas by focusing on programs that will electrify vehicles in these cities and municipalities, including electrification of buses and of vehicles in these cities' ports.

While the focus of the Mitigation Trust is on reducing NOx emissions in Connecticut—which is critical given Connecticut's present unhealthy ozone levels—strategies to mitigate NOx emissions can also have substantial climate co-benefits. In this respect as well, electrification is a superior strategy to trading one fossil fuel for another by replacing diesel with diesel or diesel with gas.

I. Nitrogen Oxides and Their Impacts in Connecticut

The term nitrogen oxides (NOx) refers to a group of highly reactive gases produced during combustion of fossil fuels.[2] Not only is NOx a pollutant in its own right, it is also a contributor to several other harmful forms of pollution including fine particulate matter, acid rain, and ground-level ozone. Acid rain is particularly damaging to the land and water ecosystems,[3] such as the Connecticut and Quinnipiac Rivers, where the nitrogen from acid precipitation upsets the delicate chemical balances in these habitats, jeopardizing populations of shellfish and bony fish,[4] industries that bring tens of millions of dollars to the state each year and depend on unpolluted environments.

[2] https://www.epa.gov/no2-pollution/basic-information-about-no2#Effects
[3] https://www.epa.gov/no2-pollution/basic-information-about-no2#Effects, http://pubs.acs.org/doi/abs/10.1021/es401046s
[4] http://www.nrcresearchpress.com/doi/abs/10.1139/f09-002#.WEBOt7IrJph

Ground-level ozone also represents a serious public health issue in Connecticut. Ozone forms when NOx reacts with volatile organic compounds in the presence of heat and sunlight. It is a potent asthma trigger and a powerful irritant to lungs, especially in the most vulnerable populations: children, asthmatics, and the elderly. Ozone is also linked to reproductive impacts, and premature mortality.[5] Reducing ozone-forming pollution is especially critical for Connecticut, which continues to suffer from some of the highest ozone levels in the Eastern United States. Ten of the twelve ozone monitors in Connecticut, located in six different counties, recorded 2013-15 ozone levels that exceed EPA's recently promulgated National Ambient Air Quality Standards for ozone of 70 parts per billion (ppb).[6] Nine of those ten monitors recorded ozone levels that also exceeded EPA's prior, less-health-protective 75 ppb standard, highlighting the significant additional work still required to make Connecticut's air safe for all residents to breathe.

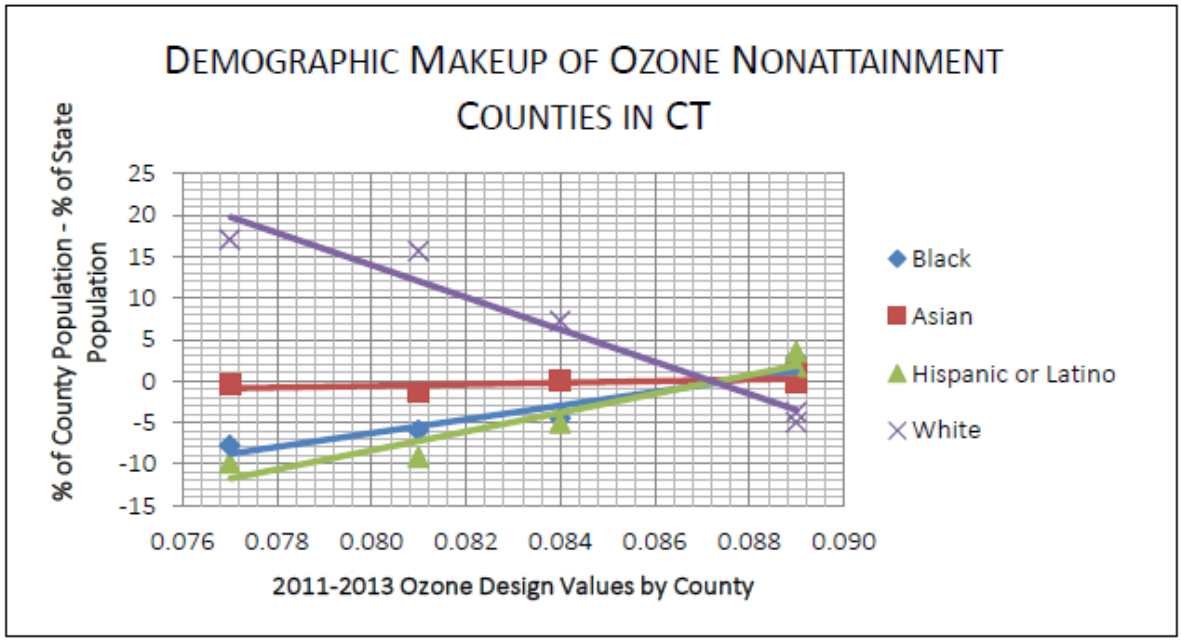
Moreover, ozone's impacts in Connecticut are not equally distributed. Connecticut's most severe ozone impacts are unjustly falling on people of color, raising environmental justice concerns. The figure below compares monitored ozone levels for a county with that county's demographic composition relative to the state as a whole using U.S. Census Bureau data. The data show that black and Hispanic residents are under-represented in the counties with less severe ozone problems and over-represented in the county with the most severe ozone problem. And this trend is observed nationwide – a census of the US near-roadway populations found that 19.3% of US population lives near a high volume road, and minorities and low-income households are over represented in this population.[7] Therefore, addressing transportation related NOx pollution will address the environmental justice inequities observed.

[5] Hansen et al. (2006). Maternal exposure to low levels of ambient air pollution and preterm birth in Brisbane, Australia. BJOG.113: 935-941. http://dx.doi.org/10.1111/j.1471-0528.2006.01010.x. (finding a 26% increase in risk of pre-term birth at maximum smog levels of only 61.1 parts per billion); *see generally* E.P.A. Integrated Science Assessment for Ozone (2013) at 2-22 (summarizing existing research).

[6] EPA 2013 – 15 Ozone Design Values. Table 4. County-Level Design Values for the 2015 8-hour Ozone NAAQS

[7] http://www.sciencedirect.com/science/article/pii/S1361920913001107

Figure 1: Over/Under-Representation of Groups By County Ozone Level in Connecticut – This graph compares monitored ozone levels for a county with that county's demographic composition relative to the state as a whole using U.S. Census Bureau data.



In Connecticut, the primary sources of NOx are mobile sources (on-road and non-road vehicles and equipment), fuel combustion (including electric generating equipment) and waste disposal, of which the mobile sector accounts for approximately two-thirds of total NOx.

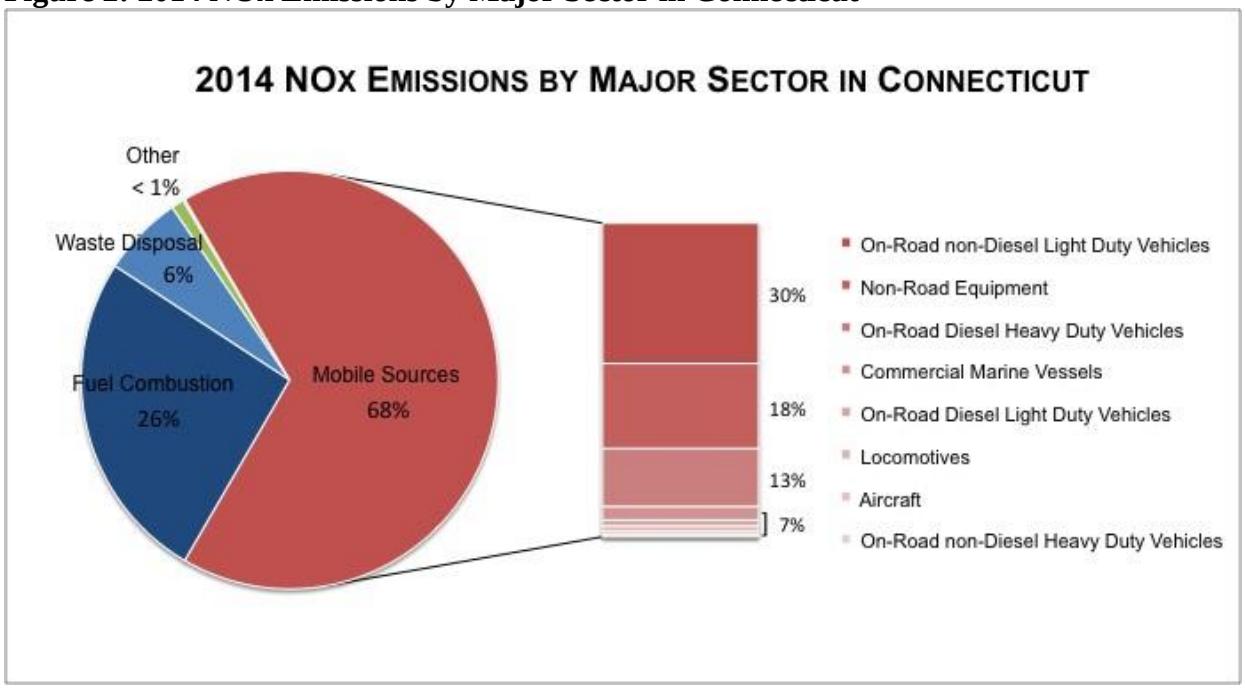
Table 1: 2014 NOx Emissions in Connecticut by Major Source Sector

Major Sector Sources	2014 NOx Emissions (tons)	Percentage of Total
Mobile	39315.67	66.79%
Fuel Combustion	15184.08	25.79%
Waste Disposal	3695.72	6.28%
Biogenics	576.08	0.98%
Miscellaneous Non-Industrial NEC	63.63	0.11%
Fires	16.87	0.03%
Industrial Processes	13.99	0.02%

Source: U.S. EPA 2014 National Emissions Inventory

The following table breaks down the mobile source component in more detail. As the table shows, more than 70% of the mobile source NOx emissions (and nearly 50% of total statewide emissions) come from on-road diesel heavy-duty vehicles and non-road equipment, making these source categories particularly important for the State to target in allocating Mitigation Trust funds.

Figure 2: 2014 NOx Emissions by Major Sector in Connecticut



II. Connecticut Should Use the Full 15% of Allowable Mitigation Trust Funding to Foster Development of Electric Vehicle Charging Infrastructure

In order to maximize reductions in NOx emissions while significantly advancing progress toward meeting state climate goals and fostering demand for EVs consistent with Connecticut Zero Emission Vehicle Memorandum of Understanding (ZEV MOU) commitments, Connecticut should utilize the full 15% of allowable Mitigation Trust funding for EV charging infrastructure. On-road non-diesel light duty vehicles presently account for 30% of all NOx emissions in the state, exceeding emissions from power plants (26%) and all other mobile source categories. Strategic investments in EV charging infrastructure targeting this mobile source segment can simultaneously advance multiple state goals.

A. Investments in EV Charging Infrastructure Will Produce Significant NOx Benefits

Transportation plays a significant role in driving unsafe levels of smog and other pollution that adversely affects public health. A 2013 MIT study found that, of all sectors, the transportation sector was the greatest contributor to premature emissions–related deaths in the U.S., resulting in 53,000 early deaths per year from vehicle tailpipe emissions.[8]

Sierra Club retained Sonoma Technology Inc. to conduct photochemical modeling using the Comprehensive Air Quality Model with Extensions (CAMx) ozone source apportionment tool to understand, among other things, the contribution of tailpipe NOx emissions from the

[8] Massachusetts Institute of Technology Laboratory for Aviation and the Environment (2013) Air Pollution Causes 200,000 early deaths each year in the U.S. http://lae.mit.edu/air-pollution-causes-200000-early-deaths-each-year-in-the-u-s/

passenger vehicle fleet to observed ozone levels. The model, which uses emission data from U.S. EPA's 2011 National Emissions Inventory, provides information on the relative proportion of observed ozone levels that attributable to different sources and source sectors. This helps inform the magnitude of the potential air quality benefit achievable through reducing NOx emissions from those sources and source sectors.

On-road vehicles in Connecticut are major contributors to observed ozone levels in the State, as highlighted by the table below. Of the 62 monitor-exceedance days of EPA's 70 ppb 2015 ozone NAAQS during the 2011 ozone season, the modeling indicates that on 55 of these days in-state on-road mobile sources significantly contributed to the nonattainment (defined by EPA as contributing more than 1% of the NAAQS). Indeed, maximum contributions from in- state on-road vehicles for most monitors exceeded 10% of the NAAQS (i.e., 7 ppb), with maximum modeled contributions from in-state on-road vehicles of 10 ppb or more at five of Connecticut's 12 monitors. And in-state on-road vehicles contributed more than 1% of the NAAQS on as many as 102 of the 152 ozone season days in 2011 at certain Connecticut monitor locations.

Table 2

AQS Site	Monitor County	Number of Modeled Days in Exceedance	Number of Modeled Days in Exceedance w/ Significant Impact from On-Road Sourc	Max Modeled Apportionment 8-hour Avg O3 (ppb)	Max Modeled On-Road O3 Contribution	Number of Days with Significant Impact* from On-Road Sourc
90159991	Windham	3	3	84.9	6.6	81
90131001	Tolland	5	5	102.3	10.5	85
90110124	New London	3	3	90.9	7.4	62
90099002	New Haven	12	11	94.7	10.4	86
90090027	New Haven	8	8	95.5	9.9	94
90070007	Middlesex	4	4	88.3	10.0	100
90050005	Litchfield	2	0	83.2	7.9	50
90031003	Hartford	2	2	102.5	11.4	102
90019003	Fairfield	8	7	97.7	10.0	84
90013007	Fairfield	10	9	99.8	9.2	83
90011123	Fairfield	5	3	98.0	9.8	67
90010017	Fairfield	0	0	71.0	5.8	37
		62	**55**	**102.5**	**11.4**	**931**

B. Investments in EV Charging Infrastructure Will Produce Significant Climate Co-Benefits

Not only will accelerating vehicle electrification reduce tailpipe NOx emissions, it will also generate significant climate benefits. Well-to-wheel studies (studies that consider all sources of greenhouse gases, including fuel production, fuel storage, fuel delivery, and vehicle energy use) agree that electric vehicles emit the far fewest amounts of pollutants into the air.[9]

Additionally, as the power grid becomes cleaner, EVs will leave a continually declining carbon footprint.

[9] http://www.energy.ca.gov/2007publications/CEC-600-2007-004/CEC-600-2007-004-F.PDF

Connecticut, through the Governor's Council on Climate Change (GC3), is currently grappling with strategies to achieve Connecticut's long-term 2050 climate goals. Under the Global Warming Solutions Act, Connecticut has committed reduce its GHG emissions by 80% from 2001 levels.[10] Based on Connecticut's most recent GHG emission inventory, the transportation sector accounts for 36.1% of the State's emissions (calculated on a consumption basis). The GC3 has identified GHG reductions from transportation as a core building block in its strategy to achieve its 2050 climate goals and is looking for emissions from this sector to account for 39% of the additional emission reductions needed between 2015 and 2050.[11]

Based on lifecycle emission data, from a GHG gas emission perspective, EVs in New England already achieve the equivalent of 86 miles per gallon,[12] and as noted above, this figure will increase as Connecticut and other New England states continue to decarbonize the power sector. Widespread strategic deployment of EV charging infrastructure (as discussed below) will accelerate EV deployment and help to drive significant reductions in GHGs.

C. Investments in EV Charging Infrastructure Will Facilitate Achievement of Connecticut's ZEV MOU Commitments

Connecticut has not only committed to reducing greenhouse gas emissions within the state, it has specifically committed to rapidly accelerating the number of zero emission vehicles (ZEVs) on the road. In 2013, the governors of eight states including Connecticut signed a memorandum of understanding committing to coordinated action to ensure the successful implementation of their state ZEV programs and put 3.3 million zero emission vehicles on the road by 2025.[13] Under the ZEV MOU, between model years 2018 and 2025, the ZEV sales mandate will cumulatively require auto manufacturers to sell 154,000 ZEVs in Connecticut.

Investments in EV charging infrastructure are critical to putting zero emission vehicles on the road in Connecticut. Studies have concluded that the absence of an adequate, existing charging infrastructure for light-duty vehicles ("LDV") EVs is an impediment to rapidly increasing EV adoption.[14] This is true for several reasons. First, it creates a higher up front capital cost to an EV user to install a charger. Second, many potential EV owners neither own nor operate a parking space that they can install a charger in. Third, the lack of a robust charging infrastructure on highways contributes to range anxiety. Fourth, the lack of visible, installed charging infrastructure results in lower public awareness of electric vehicles. Using the settlement funding to build out charging infrastructure in appropriate locations can overcome these hurdles and support the trends already observed throughout Connecticut.

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[10] https://www.cga.ct.gov/2008/ACT/PA/2008PA-00098-R00HB-05600-PA.htm

[11] Connecticut Dept. of Energy and Envtl. Protection, GC3 Meeting November 14, 2016 Slide Presentation, at Slide 8.

[12] Union of Concerned Scientists, "Cleaner Cars from Cradle to Grave: How Electric Cars Beat Gasoline Cars on Lifetime Global Warming Emissions" (Nov. 2015), at 2.

[13] https://www.zevstates.us/

[14] International Energy Agency, "Technology Roadmap: Electric and Plug-in Hybrid Electric Vehicles," June 2011, available at: http://www.iea.org/publications/freepublications/publication/EV_PHEV_Roadmap. pdf ; UBS Report. See also, National Academy of Sciences ("federal financial incentives to purchase PEVs should continue . . . .").

D. In Order to Strategically Build out Connecticut's LDV Charging Infrastructure, the State Should Target the Following Areas: Highways, Multi-unit Dwellings, Workplaces, and Disadvantaged Communities

Several factors provide helpful guidance in determining where to build out charging infrastructure: (1) Is there an impediment to the market providing charging in these locations; (2) Are the locations places where the parked vehicles have long "dwell" times (i.e., are parked for periods of time sufficient to charge the vehicle); (3) Are the locations accessible by large numbers of potential EV drivers; (4) Are the locations likely to increase public awareness; and (5) Are the investments providing benefits equitably, including to disadvantaged communities. Based on consideration of these factors, we believe prudent near-term investments in LDV EV charging infrastructure should be made in the following types of locations: Highways, Multi-Unit Dwellings, Workplaces, and Disadvantaged Communities.

1. LDV Charging Priorities: Highways

Mitigation Trust funding should be used to build out high speed direct current ("DC") charging infrastructure on highways. To do so will be critical to resolving range anxiety and increasing public awareness.

Access to DC fast charging influences consumer's choices and is therefore an important part of a comprehensive charging network. One critical benefit of DC fast charging is that it enables planning inter-city and long-distance travel that is otherwise impossible or impractical for battery-only electric vehicle drivers.[15] In addition to inhibiting distance travel and exacerbating range anxiety, consumer research indicates that a "lack of robust DC fast charging infrastructure is seriously inhibiting the value, utility, and sales potential" of typical pure-battery electric vehicles.[16] Consequently, increased access to DC fast charging stations must be achieved in order to build an effective EV infrastructure that will drive EV adoption.

As with many network industries, the development of DC fast charging networks suffers from a "chicken-or-the-egg" market coordination problem. Prospective EV owners are reluctant to purchase an electric car in the face of limited access to charging infrastructure because the EV's range and use would be limited. Likewise, prospective hosts and private funders of EV charging infrastructure cannot see a business case for EV charging station investment where too few EVs are in use to provide a return on investment.

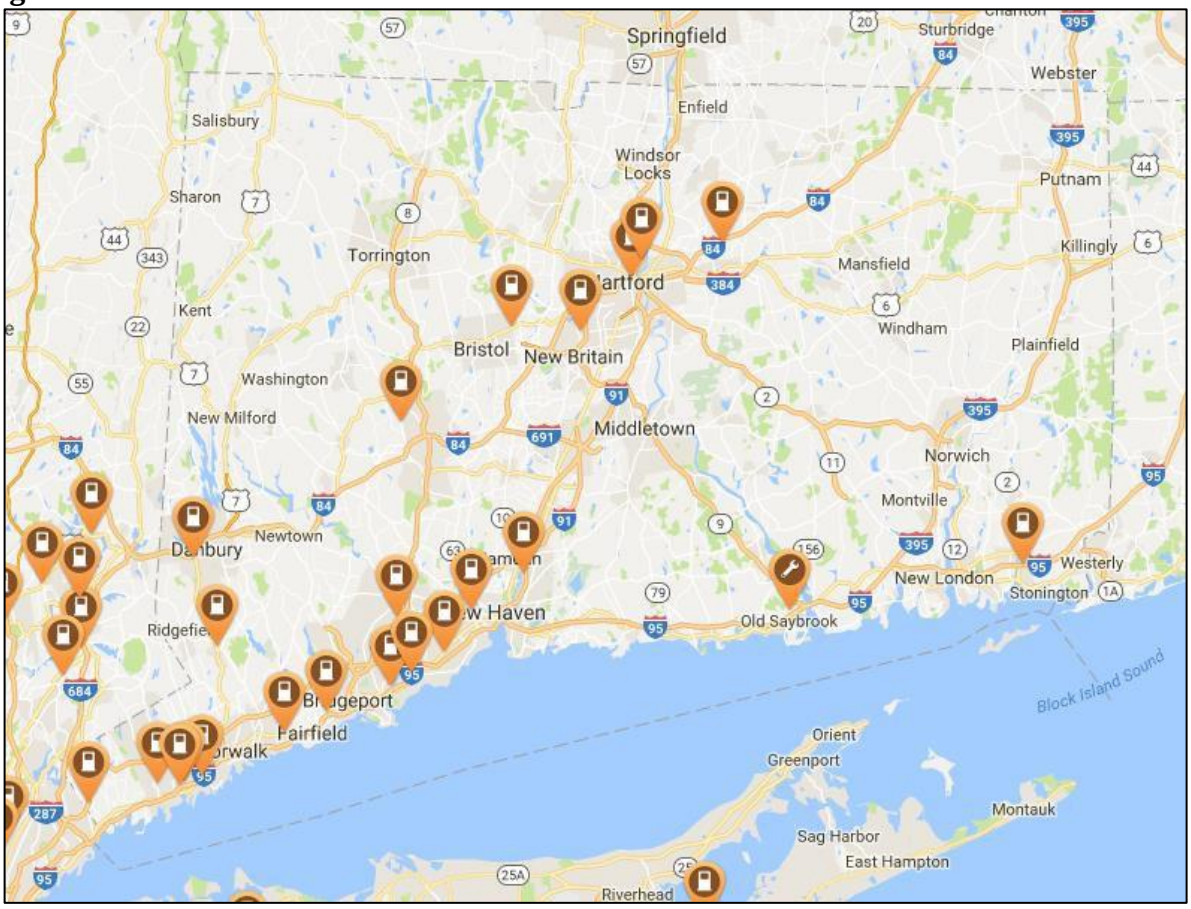
The market coordination problem is acute for DC fast charging stations, which have high upfront costs and require significant revenues for the owner-operator to achieve profitability.[17] However, quantitative research on this "chicken-or-the-egg" problem in the EV context not only indicates that the increased supply of more EVs would drive the deployment of more public charging and vice-versa, but that a financial subsidy given to infrastructure investment will

[15] Nick Nigro et al. *Strategic Planning to Implement Publicly Available EV Charging Stations: A Guide for Businesses and Policymakers* (2015) at 11.
[16] PlugShare, *New Survey Data: BEV Drivers and the Desire for DC Fast Charging* (March 2014).
[17] Nick Nigro et al. *Strategic Planning to Implement Publicly Available EV Charging Stations: A Guide for Businesses and Policymakers* (2015).

increase EV sales by more than twice the amount of the increase if the financial incentive is provided for EV purchase.[18]

Given the discrete number of high-traffic commuting corridors in Connecticut and their modest length, a robust network of DC fast chargers could be established fairly easily in the State. Indeed, the Department of Transportation has already recognized four highway corridors as electric vehicle charging corridors: all portions of I-84, I-91 and I-95, and I-395 from Waterford, Connecticut to the Massachusetts border. As the figure below illustrates, there are significant gaps in coverage on these corridors, including I-95 east of New Haven, I-84 both east and west of Hartford, I-91 between New Haven and Hartford, and I-395 throughout its entire length.

Figure 3



Adopted from PlugShare, a map of DC fast charger or super charger stations available in Connecticut to EV drivers. (Note that this map excludes Tesla fast chargers, which are not available to non-Tesla drivers)

Connecticut should use a portion of the Mitigation Trust funding to help advance the buildout of DC fast chargers along these four heavily-used highway corridors.

[18] Li S et al, *The Market for Electric Vehicles: Indirect Networks Effects and Policy Design*.

2. LDV Charging Priorities: Multi-unit dwellings

Mitigation Trust funds should also be used to build out charging infrastructure at multi-unit dwellings. Studies have shown that most charging is done at locations with long term "dwell times" during which batteries can recharge, such as homes. The National Research Council of the National Academy of Sciences characterizes home charging as a "virtual necessity" for all EV drivers, and that residences without access to electric vehicle charging "clearly [have] challenges to overcome to make PEV ownership practical."[19] Drivers are very unlikely to purchase an EV if they cannot charge at home.[20]

Unfortunately, many people living in urban environments do not own or otherwise control their parking shared space. In fact, research shows that fewer than half of all vehicles in the U.S. have access to a dedicated off-street parking space at a residence where a charging station could be installed by the owner.[21] These include people that live in large multi-unit dwellings and park in garages or parking lots, as well as people that rely on street parking. The industry term for such people is "garage orphans," and they often either lack the ability to install a charger or face serious challenges to doing so. One such study conducted for Eversource Utility in Boston, Massachusetts, found that the garage orphan effect resulted in most EV owners being individuals who live in single family homes, often clustered in more 'leafy' suburban neighborhoods.[22]

Meanwhile, the owner or operator of the garage or parking lot may lack sufficient incentive to spend capital to install chargers. The investment in charging infrastructure may not be recoverable within the expected tenure of renters. Moreover, costs of charging infrastructure at a distance from the building, such as in a parking lot, will likely be higher than installation in a single-family house.

Connecticut should use a portion of the Mitigation Trust funds to overcome the unique barriers to access infrastructure faced by residents of multi-unit dwellings by establishing programs to subsidize its development. Doing so will unlock the ability for people living in multi-unit dwelling in urban areas to charge their vehicle overnight while they sleep.

3. LDV Charging Priorities: Workplaces

Mitigation Trust funds should also be used to build out charging at workplaces. Workplaces offer another location with long dwell times to recharge batteries, and access to electricity fuel at workplaces reduces "range anxiety," improves the EV value proposition, and

[19] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press at 9 (2015).
[20] See Adam Langton and Noel Crisotomo, *Vehicle-Grid Integration*, California Public Utilities Commission at 5 (October 2013).
[21] Traut, Elizabeth et al., *US Residential Charging Potential for Electric Vehicles,* Transportation Research Part D 25 (November 2013): 139-145.
[22] *Accommodating Garage Orphans in Boston, Cambridge, and Somerville*, by WXY, available at http://wxystudio.com/uploads/1700017/1441308185862/GarageOrphanReport_v2.1_08182015.pdf

greatly increases consumer awareness of EVs. According to the U.S. Department of Energy, people who have access to workplace charging stations are 20 times more likely to become EV owners.[23] Likewise, the National Research Council study also reports that charging at workplaces offers an important opportunity to increase EV adoption and to increase electric miles driven.[24]

4. LDV Charging Priorities: Disadvantaged Communities

In both siting charging infrastructure and in education and outreach, Connecticut should seek to serve disadvantaged communities. As noted in a 2011 report by The Greenlining Institute, such communities are more heavily impacted by air pollution and are more concerned by it. They are a natural but largely untapped market for EVs.[25] Moreover, as section 5.2.10 of the Settlement Agreement provides, in approving plans states must provide:

> A description of how the Eligible Mitigation Action mitigates the impacts of NOx emissions on communities that have historically borne a disproportionate share of the adverse impacts of such emissions.

Ensuring that multi-unit dwellings and workplaces in disadvantaged and environmental justice communities are provided charging infrastructure is a critical component of any plan to use Mitigation Trust funds.

Use of funding for LDV charging infrastructure should be conditioned on a load management tool, such as time-of-use rates, and should result in opportunities for fuel cost savings compared to fossil fuels.

In addition, electricity is a fundamentally cheaper fuel than gasoline, and that advantage for PEV drivers should not be overridden, particularly using settlement funds intended for public benefit. Fuel cost savings are a key driver of EV purchases. One survey of over 16,000 EV drivers found that "saving money on fuel costs" was the most important motivator of their EV purchase.[26] The use of Mitigation Trust funds should therefore be conditioned on charging rates being reasonable and delivering the fuel cost savings that electricity can provide.

E. An Investment in EV Charging Infrastructure Will Produce In-State Economic Benefits, Increase In-State Jobs, and Save Connecticut Residents Money

To electrify Connecticut's transportation sector, the state will have to build out the charging network and other assets. Doing so creates well-paying construction jobs. For example, NRG estimated that just its initial buildout of charging infrastructure in California

[23] U.S. Department of Energy, *Workplace Charging Challenge Progress Update 2014: Employers Take Charge*, 5 (2014), available at: http://www.energy.gov/sites/prod/files/2015/11/f27/WPCC_2014progressupdate_1114.pdf
[24] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press at 9 (2015).
[25] C.C. Song, *Electric Vehicles; Who's Left Stranded?*, The Greenlining Institute at 4 (August, 2011).
[26] Center for Sustainable Energy, *California Plug-in Electric Vehicle Owner Survey Dashboard*

would generate 1,500 in-state jobs.[27] NRG expects that its $102.5 million investment to build electric vehicle (EV) charging infrastructure in California will also "create a gross output of more than $185 million when the employment and procurement of goods and services are factored together, equating to an additional $83.3 million in indirect economic activity by 2016."[28] As Terry O'Day, NRG Director of California Business Development, explained, the project will "build out the California EV infrastructure . . . while also contributing to the California economy through job creation and infrastructure spending."[29]

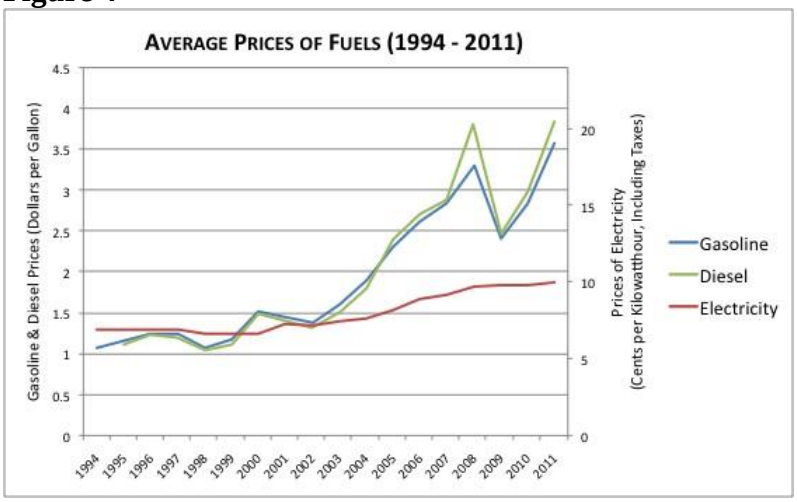
Jobs are also created as people are needed to manufacture the charging equipment itself. Rocky Mountain Institute reports that EnerDel added 1,400 jobs at its Indiana- based EV lithium-ion battery plant and plans to add another 3,000 to meet growing demand.[30] California- based charging station manufacturers Coulomb Technologies has grown from two to 100 jobs
over the early stages of vehicle electrification efforts, according to a company representative.[31]

Electrifying Connecticut's transportation will also save residents money on fuel costs. It is cheaper to fuel a vehicle with electricity than with oil, or even natural gas. As the US Department of Energy ("USDOE") explains, using gasoline as a surrogate, "[o]n average, it costs about half as much to drive an electric vehicle" in terms of cost per gallon of gasoline versus the cost per "gallon equivalent" of electricity. In Connecticut, despite persistent low gas prices and higher than average retail electric rates, an "e-gallon" retails for $1.73, while regular gasoline costs $2.26.[32]

Furthermore, the price volatility of fossil fuels is notorious and subjects Connecticut's residents and businesses to expected fluctuations in the costs of living and conducting business. In comparison, electricity prices are highly stable and consistent over time. This is evident in the graph below comparing the fluctuating cost of diesel versus electricity since 2008, using data from the EIA:

[27] EVgo. (2012) *NRG Investment in California EV Charging Stations to Create More Than 1,500 Local Jobs*. < https://www.nrgevgo.com/about/news/nrg-investment-in-california-ev-charging-stations-to-create-more-than-1500-local-jobs/ >
[28] Id.
[29] Id.
[30] Mattila, M., Bellew, J.L. (2011) "Do EVs Create Jobs and Improve the Economy?" Rocky Mountain Institute; http://www.rmi.org/DoEVsCreateJobsImproveEconomy
[31] Id.
[32] *See* https://www.energy.gov/maps/egallon#.

Figure 4



Using the Mitigation Trust funds to advance engine electrification therefore keeps Connecticut's hard earned money in state. It leads to lower fuel costs for Connecticut's residents and businesses. And it will help protect them from the price shocks that come from fossil fuel price volatility.

Investment in electric transportation also saves Connecticut's electric customers money by placing downward pressure on electricity rates. This benefits all utility customers, regardless of whether they own electric transportation vehicles. Electric vehicle charging will increase electricity sales, which if well integrated into the electric power system can dilute the fixed costs of electricity transmission and distribution and lower electricity rates for all utility customers.[33] Vehicles are used for transportation during only a small fraction of the day, and therefore an EV can be charged nearly any time. Connecticut's electricity grid – from the poles and wires to the power plants – is designed for the heaviest electricity demands, which rarely occur. If vehicle charging is managed to occur during off-peak periods (when the electric grid is underutilized and there is plenty of spare capacity in the generation, transmission, and distribution system) this new load can be served by existing and often underutilized infrastructure without proportionally increasing a utility's costs. In turn, this can reduce the average cost of power for all utility customers. Similarly, EV load can be shifted to facilitate the integration of variable generation from renewable sources.[34] By managing EV charging to match electricity demand with renewable generation, we can stabilize power flows and reduce the average cost of power.

[33] *See, e.g.*, Rocky Mountain Institute, *Electric Vehicles as Distributed Energy Resources* at 19 (2016); Natural Resources Defense Council, *Driving Out Pollution*: *How Utilities can Accelerate the Market for Electric Vehicles* at 10 (2016); Regulatory Assistance Project, *In the Drivers Seat: How Utilities and Consumers Can Benefit From the Shift to Electric Vehicles* at 5, 13 (April 2015); CAISO, *California Vehicle-Grid Integration (VGI) Roadmap: Enabling Vehicle-Based Grid Services* at 5; ICF International and Energy+Environmental Economics, *California Transportation Electrification Assessment, Phase I* at 38 (2014); ICF International and Energy+Environmental Economics, *California Transportation Electrification Assessment, Phase II* at 55-70 (2014).

[34] Regulatory Assistance Project, *In the Drivers Seat: How Utilities and Consumers Can Benefit From the Shift to Electric Vehicles* at 5, 13 (April 2015); CAISO, *California Vehicle-Grid Integration (VGI) Roadmap: Enabling Vehicle-Based Grid Services* at 5. (2014).

Analysis performed by the Pacific Northwest National Laboratory shows that large numbers of EVs charging during off-peak hours could significantly lower the marginal cost of energy.[35] The same analysis found that there is sufficient spare generation capacity in the nation's electric grid to power nearly the entire light-duty passenger fleet if vehicle load is integrated during off-peak hours and at lower power levels.[36]

III. For the Remainder of the Mitigation Trust Funds, Connecticut Should Prioritize Electrification Over Alternate-Fueled Options, and Prioritize Electrification of Buses, Drayage Trucks and Forklifts at Ports, and Other Heavy-Duty Trucks

In addition to investing 15% of the Mitigation Trust funds towards EV infrastructure, we recommend that Connecticut invest in electrification of diesel buses, drayage trucks and forklifts at ports, and heavy duty trucks. These categories of vehicles contribute the largest fraction of Connecticut's NOx pollution. At the same time, diesel buses and port equipment disproportionately impact disadvantaged communities, meaning that these communities stand to benefit the most from investments in electrification. We emphasize the importance of electrifying these vehicles, rather than switching from diesel to alternate-fueled engines such as new diesel and compressed natural gas. As discussed above, electrification of Connecticut's transportation sector keeps money in state, saves money through lower electricity rates, drastically reduces NOx, smog, and greenhouse gas levels to protect health and environmental justice communities, and likewise reduces GHG emissions throughout the state. The same benefits apply when upgrading non-road equipment and heavy-duty vehicle engines. Electrification also makes good economic sense. Although the cheaper upfront costs for new-diesel and alternate-fueled engines may be initially attractive, the more important costs for the State to consider are the lifetime costs of these vehicles. This is particularly true because the Mitigation Trust funds will contribute to covering the upfront program costs to replace and repower engines, while subsequent fuel and maintenance costs will fall on the State, its residents, and its companies. Electrifying vehicles and equipment is a good investment since the lifetime costs are significantly cheaper than those of alternate-fueled vehicles and new diesel engines.

A. Electrifying Connecticut's Non-Road Equipment: Drayage Trucks and Forklifts at Ports

Within the mobile sector, non-road equipment accounts for the second greatest source of NOx emissions in Connecticut (18%).[37] Within this category, there are a variety of opportunities to electrify and therefore completely eliminate the exhaust emissions derived from these sources—including electric drayage trucks and electric forklifts. Both of these vehicle types are very commonly used around ports, which are particularly dirty and often situated in close proximity to lower-income communities. Based on a review of available data, EPA approximates that 40% of "Principal Ports" are located in or near areas that have violated a NAAQS (nonattainment areas) or have previously violated but are now meeting a NAAQS (maintenance

[35] Michael Kintner-Meyer, Kevin Schneider, & Robert Pratt, *Impacts Assessment of Plug-in Hybrid Vehicles on Electric Utilities and Regional U.S. Power Grids*, November, 2007.
[36] *Id.*
[37] https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data

areas),[38] including Connecticut's ports. This therefore presents an opportunity for the State

to address environmental justice concerns by electrifying drayage and forklift engines.

Drayage trucks, the short-haul transport vehicles used to move "cargo to and from ports and intermodal rail yards," are now available with clean, electric engines.[39] Many existing drayage trucks are retired long-haul vehicles repurposed to serve shorter routes.[40] Due to this practice, the drayage fleet is made up of old, outdated, high emitting vehicles. Indeed, EPA estimates that in 2011 50% of the national drayage fleet was made of pre-1997 models, and that the same category will still comprise 24% of the fleet in 2020.[41] Drayage operators expect trucks to last an average of 10 years.[42] Replacing these old models with all electric trucks will therefore deliver lasting reductions in NO_x, PM and CO_2.[43]

Emission reductions from drayage trucks are largely dependent on the model year of the vehicle being replaced. [44] However, as a general matter, one can expect to achieve between 840 and 1,105 lbs per year of NO_x reductions by electrifying a single drayage vehicle.[45] PM and CO_2 reductions are similarly significant: 21.7 lbs/year of PM and 12 tons of CO_2 reductions per year.[46]

Electric drayage trucks are currently more expensive than traditional diesel models. However, electric drayage trucks have far lower fuel and maintenance costs than diesel vehicles—a more important consideration with respect to the Mitigation Trust. Indeed, variable costs for all-electric drayage trucks are 50-85% lower than for their diesel counterparts.[47] The owner of a diesel truck must regularly change oil, pass emissions tests, repair/replace brakes, and pay for diesel fuel. The owner of an electric truck can expect reduced or eliminated costs for each of these areas. TransPower estimates that the energy cost per mile of a diesel drayage truck is $1.49/mile while a TransPower electric drayage truck registers a per mile cost of only $0.23.[48] Additionally, the cost of these zero emission vehicles is expected to dramatically decrease over the next fifteen years due to advances in battery production. As the capital requirements for drayage vehicles draw closer to equivalence, the economic benefits of electric trucks become even more pronounced.

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[38] https://www.epa.gov/sites/production/files/2016-09/documents/420s16002.pdf
[39] Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 11.
[40] National Port Strategy Assessment, *supra* note 2 at 14.
[41] *See* National Port Strategy Assessment, *supra* note 2 at tbl. 5-6.
[42] Andrew Papson & Michael Ippoliti, CALSTART, *Key Performance Parameters for Drayage Trucks Operating at the Ports of Los Angeles and Long Beach* 15 (Nov. 15, 2013) (providing results of Drayage Operator Usage Survey).
[43] EPA's emission standards for pre-2004 trucks allowed more than four grams of NO_x/bhp-hr, a rate that has since been lowered to .2 g/bhp-hr. *See* U.S. EPA, *Emission Standards Reference Guide*, available at https://www.epa.gov/emission-standards-reference-guide (last visited Sep. 29, 2016).
[44] Mitigation funds are available to target trucks with model years between 1992 and 2006. If state regulations already require replacing vehicles with these model years, then the eligible class expands to include model year 2007-2012 trucks. *See* Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 1.
[45] National Port Strategy Assessment, *supra* note 2 at 43.
[46] National Port Strategy Assessment, *supra* note 2 at 43.
[47] Ambrose Hanjiro & Miguel Jaller, *Electrification of Drayage Trucks: On Track for a Sustainable Freight Path* at 14, Transportation Research Board 95th Annual Meeting, No. 16-5924 (Aug. 1, 2015).
[48] *High Power Electric Systems for Transportation and Storage*, Transpower, slide 10 (Dec. 2, 2015) *available at* http://steps.ucdavis.edu/files/12-03-2015-Joshua-GoldmanTransPower.pdf.

These technologies have already been successfully demonstrated. In 2012, the Southern California Air Quality Management District engaged nine battery-electric trucks in a pilot project. SCAQMD has subsequently reinvested in 43 more electric drayage vehicles.[49] Electric drayage trucks are available from Mack[50] and TransPower.[51]

Another electric non-road equipment program option would be replacing diesel and propane forklifts with all-electric models. Only forklifts with greater than 8,000 lbs. of lift capacity are eligible to receive funding.[52] Though electric forklifts require a greater up-front capital investment they already represent a large portion of the forklift fleet.[53] They also exhibit lower life-cycle costs when accounting for fuel and O&M than their diesel powered alternatives. The Energy Policy Research Institute estimates that an electric forklift with an 8,000 lb. lift capacity costs roughly $37,500 less than a similar propane model and $48,000 less than a similar diesel model over a projected six-year lifespan. This is in spite of over $9,000 more in upfront capital cost.[54] The reasons for this significant economic advantage are a large decrease in fuel and maintenance costs associated with electrification. Additionally, electric models can save up to 137,000 lbs. of CO_2 over its lifetime and entirely eliminate the local emission of carbon monoxide and toxics.[55]

B. Zero-Emission Buses

On-road diesel heavy-duty vehicles, such as buses and trucks, are accountable for 13% of Connecticut's 2014 NOx pollution. As a result, zero-emission buses and their charging infrastructure are fantastic options for use of the VW Settlement funds. Nationwide, fleets of school, transit, and shuttle buses are already being converted to these clean, cost-effective, alternatives to traditional diesel power. Transit agencies in Shreveport, Lexington, Louisville, Reno, Columbus, Dallas, Oakland, and the Quad-Cities area of Illinois, are just a handful of those investing in electric and hydrogen fuel cell buses.[56] Outside of the U.S., Tel Aviv,[57] London,[58] Barcelona,[59] and a number of Chinese cities[60] have invested in electric buses and

[49] Press Release, *State to Award $23.6 Million for Zero-Emission Trucks at Seaports*, SCAQMD, May 4, 2016, http://www.aqmd.gov/home/library/public-information/2016-news-archives/drayage-trucks
[50] Mack Trucks Inc., *Mack Trucks Demonstrating Zero-Emission Capable Drayage Trucks*, May 23, 2016, http://www.oemoffhighway.com/press_release/12210909/mack-trucks-demonstrating-zero-emission-capable-drayage-trucks.
[51] Transpower, *Electric Drayage Truck*, http://www.transpowerusa.com/downloads/Data-Sheet-Electric-Drayage- Truck-Utilizing-the-Electruck-Drive-System-1-3-14.pdf.
[52] Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 7-8.
[53] The current composition of the lift truck fleet is estimated at 60% electric, 40% combustion. Yale Materials Handling Corp., *The Truth About Electric Lift Trucks* (2010).
[54] Electric Power Research Institute, *Lift Truck Comparison with Capital Costs*, http://et.epri.com/Calculators_LiftTruckComparison_with_cap2.html (last visited Sep. 30, 2016).
[55] *Id.*

[56] *See* Proterra, *Our Customers*, https://www.proterra.com/our-story/our-customers/, for a full list of just one company's sales.
[57] Sharon Udasin, *Five Electric Buses to Begin Running in Tel Aviv*, Jerusalem Post, Sept. 16, 2016, http://www.jpost.com/Business-and-Innovation/Tech/Five-electric-buses-to-begin-running-in-Tel-Aviv-467873.
[58] *Mayor Unveils First Fully Electric Bus Routes for Central London*, Sept. 9, 2016, https://www.london.gov.uk/press-releases/mayoral/mayor-unveils-first-fully-electric-bus-routes.

charging stations. As of 2015 there were over 170,000 electric buses on the road worldwide.[61] Navigant Research projects that "the battery EV (BEV) is expected to be the leading type of electric powertrain for buses through 2026."[62]

Mitigation Trust funds are available to further support the adoption of these highly efficient alternatives to fossil fueled transportation. In addition the Mitigation Trust covers installation of charging infrastructure. As described in greater detail below, the economics already favor widespread investment in zero emission buses and their supporting infrastructure. Investment in these buses today will speed further integration as these technologies come to scale, bringing measurable economic and environmental benefits to the communities they service.

By using Mitigation Trust funds to procure zero emission buses now, our transit agencies can lock in annual savings on fuel ($40,000-$45,000 per year per bus over diesel) and maintenance. The agencies can then procure additional zero emission buses, which will lock in yet further cost savings going forward for the agency.

1. EV Buses Already Have Lower Comparative Lifetime Costs Than Diesel Buses and CNG Buses—And Costs Continue To Drop Rapidly

As discussed below, even today the lifetime cost of an electric bus is significantly lower than that of a new diesel or alternative fuel bus, though the upfront cost is higher. The all-in cost of buses--that is, the upfront cost of the bus purchase, fuel costs and maintenance costs--for electric buses is around $1,000,000, and around $1,400,000 for diesel and CNG buses.[63] Moreover, as EV bus manufacturing scales up, and as battery costs--the most expensive part of an EV--plummet over time, EV bus prices will fall rapidly as well.

a. Up Front Costs

The current sticker price of a new electric bus is about $750,000.[64] A comparable new diesel vehicle costs $480,000 and a compressed natural gas (CNG) bus $490,000, while a Fuel Cell Bus (FCB) costs over $1,000,000.[65] Transitioning to electric technology can also be

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[59] Katie Sadler, *Barcelona Unveils Two New Electric Buses and a Rapid-Charging Station*, EuroTransport, Sept. 21, 2016, http://www.eurotransportmagazine.com/20655/news/industry-news/barcelona-electric-buses-rapid-charging- station/.

[60] *See* Lindsay Dodgson, *Buses and Batteries: A Rising Sector*, May 31, 2016, http://www.power-technology.com/features/featurebuses-and-batteries-a-rising-sector-4904956/.

[61] International Energy Agency, *Global EV Outlook 2016*, 24-25 *available at* https://www.iea.org/publications/freepublications/publication/Global_EV_Outlook_2016.pdf.

[62] Electric drive buses include hybrid, fuel cell, and all-electric vehicles. Navigant Research, *Electric Drive Buses*, https://www.navigantresearch.com/research/electric-drive-buses (last visited Oct. 10, 2016).

[63] *The Business Case For the Proterra Electric Bus*, Aug. 3, 2015, http://ecomento.com/2015/08/03/business-case-proterra-electric-bus/

[64] Proterra's Catalyst bus cost $749,000 in 2016 while BYD's all-electric bus costs $770,000. Draft, Cost Model Discussion with ACT Cost Subgroup, slides 9-10 (Aug. 23, 2016) *available at* http://cafcp.org/sites/default/files/5_CARB-ACT-Cost-Model-Discussions_CaFCP-Bus-Team-Meeting- Aug2016.pdf (hereinafter "Air Resources Board Cost Model").

[65] *Id.* at slides 9 (CNG), 10 (diesel), 12 (Hydrogen Fuel Cell).

accomplished through repowering existing diesel vehicles with all-electric components, a process that costs around $500,000.[66]

Government estimates of zero-emission bus prices sharply decline as advances in battery manufacturing and increased demand drive down costs. By 2025—within the 10-year timeframe of the VW Mitigation Trust grant program—an electric bus is expected to cost $480,000, equal to or less than the cost of a new diesel vehicle.[67] Much of this decrease is attributable to projected reductions in battery costs. A California Air Resources Board-conducted literature review concluded that studies consistently place the cost of batteries below $500/kWh by 2020, and approaching $200/kWh by 2030.[68] These estimates are already outdated and clearly understate the rate of reductions in battery costs, which again are the most expensive part of an EV. GM announced that already, even in 2016, it was procuring batteries for its Bolt EV for $145/kWh.[69]

As explained below, even without future reductions in costs, EV buses, with their far lower fuel, operating, and maintenance costs, exhibit lower lifetime costs than diesel and CNG buses.

b. Fuel Savings

Electric buses offer tremendous fuel savings. For example, Proterra's all-electric Catalyst bus registers a fuel efficiency averaging 17.48 miles per diesel gallon equivalent (MPDGe) of electric charge.[70] By contrast, diesel buses average 3.26 miles per gallon (MPG)[71] and CNG buses average 4.51 MPDGe.[72] Electric costs vary by market but average $0.12/kWh nationally[73], or about $1.17 per gallon diesel equivalent[74]. By contrast, average diesel fuel prices are between $2-3 per gallon[75] and CNG costs approximately $2.05 per gallon diesel equivalent.[76] Based on these prices, an electric bus will consume about $5,000-$10,000 in electricity annually,

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[66] Repowering refers to the removal of the existing motor and drivetrain and replacement with all-electric components. *See* Rich Piellisch, *21 All-Electric ZEPS Buses for IndyGo*, Dec. 8, 2014, http://www.fleetsandfuels.com/fuels/evs/2014/12/21-all-electric-zeps-buses-for-indygo/ (21 rebuilds at a total cost of $12.2 million).

[67] Air Resources Board Cost Model, slide 10 (all values in 2016 dollars).

[68] *Id.* slide 11.

[69] Jay Cole, *GM: Chevrolet Bolt Arrives in 2016, $145/kWh Cell Cost, Volt Margin Improves $3,500*, http://insideevs.com/gm-chevrolet-bolt-for-2016-145kwh-cell-cost-volt-margin-improves-3500/.

[70] NREL, *Foothill Transit Battery Electric Bus Demonstration Results*, vii, Jan. 2016, *available at* http://www.nrel.gov/docs/fy16osti/65274.pdf.

[71] U.S. Department of Energy, Alternative Fuels Data Center, *Average Fuel Economy of Major Vehicle Categories*, http://www.afdc.energy.gov/data/10310.

[72] *Id.*

[73] U.S. Department of Transportation, *Zero Emissions Bus Benefits* https://www.transportation.gov/r2ze/benefits-of- ZEBs (last visited Oct. 10, 2016). It is important to consider that, for high power charging, additional costs beyond
volumetric electricity use may be incurred depending on the applicable utility rate structure. In particular, demand charges – costs incurred for high rate of power flow – can make a significant difference in determining fuel costs.

[74] https://www.energy.gov/maps/egallon#

[75] Average national price as of October 3, 2016 was $2.389/gallon, but varies greatly with underlying crude oil prices, *see* http://www.eia.gov/petroleum/gasdiesel/.

[76] U.S. Department of Energy, *Clean Cities Alternative Fuel Price Report* 4, tbl 2 (July 2016) *available at* http://www.afdc.energy.gov/uploads/publication/alternative_fuel_price_report_july_2016.pdf.

far lower than the $50,000/yr spent on diesel[77] or $30,000/yr spent on CNG[78] to fuel a similar vehicle. FCBs are currently more expensive. FCBs are fueled by hydrogen, which costs approximately $8/kg in 2016.[79] Notably, long-range electric buses are available on the market. Proterra offers electric buses with mileage ranges of 49-350 miles per charge,[80]and BYD sells a bus that goes approximately 155 miles.[81] New Flyer is testing a hydrogen fuel cell bus with 300 miles of range.[82] Companies such as Complete Coach Works offer rebuilt electric buses for lower cost than new buses.[83]

Variability in fuel supply also increases the difficulty of predicting an operating budget for a diesel, or CNG dependent transportation fleet. While long-term fuel contracts can insulate against these fluctuations, shifts in real world prices can still impact operations when negotiating those contracts.

c. Operating & Maintenance Costs:

Electric buses also have substantially lower operating and maintenance (O&M) expenses as compared to their diesel and CNG alternatives. With an electric or hydrogen fuel cell bus, there are no oil changes or emissions tests, fewer parts that can break, and less wear on braking systems. The average lifetime maintenance cost for an electric bus is just $0.60/mile. This is a significant reduction from the $0.85/mile associated with diesel and CNG fueled vehicles.[84]
Hydrogen fuel cell buses have an average maintenance cost of $1.00/mile.[85] Proterra estimates that over a 12 year lifetime, an all-electric bus will save its operator $448,000 as compared to a
traditional diesel vehicle, $408,000 as compared to a CNG vehicle, and $459,000 as compared to a diesel-hybrid vehicle.[86]

d. Charging Infrastructure Costs:

There are two options for electric bus charging infrastructure. First, a typical Class 3 slow charger can charge a bus in 3-5 hours. These chargers cost around $65,000 to purchase and install.[87] Again, this cost can be covered by Mitigation Trust funds. With advances in battery technology increasing bus ranges, new models can achieve up to 350 miles on a single charge,

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[77] California Air Resources Board, *Literature Review on Transit Bus Maintenance Cost (Discussion Draft)* at 7 (Aug. 2016) *available at* https://www.arb.ca.gov/msprog/bus/maintenance_cost.pdf.
[78] California Air Resources Board, *Technology Assessment: Medium and Heavy-Duty Battery Electric Trucks and Buses*, Draft, IV-5 (Oct. 2015).
[79] Air Resources Board Cost Model, slide 20.
[80] *See* Proterra Catalyst Bus Specifications, https://www.proterra.com/wp-content/uploads/2016/08/Proterra- Catalyst-Vehicle-Specs.pdf.
[81] BYD, *Electric Bus,* http://www.byd.com/na/old/auto/ElectricBus.html.
[82] Alex Roman, *What's New in Electric Buses?* Metro Magazine *available at* http://www.metro- magazine.com/sustainability/article/711947/what-s-new-in-electric-buses.
[83] Complete Coach Works, *ZEPS Electric Remanufactured Transit Bus* http://completecoach.com/zeps-timelapse/.
[84] Air Resources Board Cost Model, slide 13.
[85] Air Resources Board Cost Model, slide 16.
[86] Proterra, *The Proterra Catalyst 35-Foot Transit Vehicle,* https://www.proterra.com/products/35-foot-catalyst/ (last visited Oct. 11, 2016).
[87] Air Resources Board Cost Model, slide 24.

enough to allow an operator to charge its buses overnight and then operate all day without needing to stop to refuel.[88]

Alternatively, fast chargers can provide 30 miles worth of charge in 8-13 minutes.[89] This design allows a bus to charge during the course of its normal route, eliminating the need to come out of circulation to refuel.

2. Mitigation Trust Funds Can Be Used To Purchase and Install Electric Buses and Charging Equipment; Locked in O&M Savings Can Then Be Used to Expand the EV Bus Fleet, Generating Further Savings

Mitigation Trust funds are available to meet the higher capital requirements of an electric bus fleet, allowing a transit agency to then lock in the lower lifetime costs of EV buses. The agency can then use the lifetime savings on fuel and maintenance to procure additional EV buses and build on lifetime savings going forward.

For the reasons discussed above and depicted in the table below, once costs are viewed on a lifetime basis, investing in electricity is far preferable to diesel or CNG vehicles.

Costs (Capital + O&M) for Diesel, CNG, Electric Buses

	Diesel	CNG	Electric
Purchase Price	$480,000	$490,000	$750,000
Fuel Cost (DGe)	$2-3	$2.05	$1.29
Fuel Cost (annual)	$50,000	$30,000	$5,000-$10,000
Fuel Efficiency(MPDGe)	3.26	4.51	17.48
O&M cost ($/mile)	$0.85	$0.85	$0.60
Additional Lifetime O&M (compared to electric)[90]	$448,000	$408,000	--
Approximate Lifetime Cost	$1,348,000[91]	--	$1,180,000[92]

These savings are not exclusive to transit buses. Electric School Buses are in use by a number of municipalities throughout the country.[93] School buses are ideal fits for electrification.

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[88] *See* Proterra Catalyst Bus Specifications, https://www.proterra.com/wp-content/uploads/2016/08/Proterra-Catalyst-Vehicle-Specs.pdf. *See also* Aarian Marshall, *This New Electric Bus Can Drive 350 Miles on One Charge*, Wired, Sept. 12, 2016, https://www.wired.com/2016/09/new-electric-bus-can-drive-350-miles-one-charge/.

[89] NREL, *Foothill Transit Battery Electric Bus Demonstration Results*, 13, Jan. 2016, *available at* http://www.nrel.gov/docs/fy16osti/65274.pdf.; *see also* Proterra Catalyst Bus Specifications, https://www.proterra.com/wp-content/uploads/2016/08/Proterra-Catalyst-Vehicle-Specs.pdf.

[90] Includes savings from fuel and maintenance, *see* Proterra, *The Proterra Catalyst 35-Foot Transit Vehicle*, https://www.proterra.com/products/35-foot-catalyst/ (last visited Oct. 11, 2016).

[91] Judah Aber, *Electric Bus Analysis for New York City Transit*, Columbia University, May 2016, 16 fig 7, http://www.columbia.edu/~ja3041/Electric%20Bus%20Analysis%20for%20NYC%20Transit%20by%20J%20Aber%20Columbia%20University%20-%20May%202016.pdf.

Buses typically operate two shifts each day, once in the morning and again in the afternoon. Down time between shifts allows buses to fully recharge. In King County, California, two electric school buses were estimated to save roughly 16 gallons of fuel per bus per day. This amounted to an annual fuel saving of over $11,000 per bus.[94]

C. Electric Trucks

Similar to electric buses, electric trucks are a smart option for Mitigation Trust funds and have the opportunity to provide great NOx emissions reductions for the state of Connecticut. Electric medium duty trucks (Class 4-6) are widely used and in active service on the road today. With plummeting battery costs, heavy duty and long haul (Class 7 and higher) electric vehicles are already in pilots and on their way to market. Class 4-7 diesel trucks are eligible for Mitigation Trust funds. These trucks weigh between 14,001 and 33,000 lbs. and include, but are not limited to, delivery trucks, box trucks, beverage distribution trucks, rack trucks, and refuse vehicles.[95]

1. Electric trucks are already being used by businesses across America.

Staples, Frito-Lay, FedEx, UPS, and Coca-Cola are a few of the private firms that have successfully integrated on-road medium size electric trucks into their fleets. Electric medium trucks are available from Smith Electric, ZeroTruck, Boulder Electric Vehicle, EVI-USA, and Freightliner Customer Chassis Corp.[96] These companies offer a number of configurations, primarily for localized/urban (so-called "last mile") delivery and goods/refuse hauling.[97] Because of limited battery range --typically a 100-mile maximum—today's electric medium duty trucks are most effectively deployed in urban or short haul settings.[98]

Larger auto manufacturers are also developing these technologies to meet both growing market demand and environmental regulations. Mercedes recently unveiled its Urban eTruck

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[93] *See e.g.*, James Ayre, *Massachusetts Puts $1.4 Million into Electric School Bus Pilot Program*, Aug. 16, 2016, https://cleantechnica.com/2016/08/16/massachusetts-puts-1-4-million-electric-school-bus-pilot-project/; Nicole Schlosser, *Can Electric School Buses Go the Distance?* May 23, 2016, http://www.schoolbusfleet.com/article/713421/can-electric-school-buses-go-the-distance (providing an overview of state and local pilot projects); Larry Hall, *Tech: The Yellow School Bus Is Going All Electric*, Clean Fleet Report, Mar. 26, 2016, http://www.cleanfleetreport.com/tech-yellow-school-bus-going-electric/.

[94] Larry Hall, *Tech: The Yellow School Bus Is Going All Electric*, Clean Fleet Report, Mar. 26, 2016, http://www.cleanfleetreport.com/tech-yellow-school-bus-going-electric/.

[95] The Partial Consent Decree allows funding for Class 4-7 Local Freight Trucks with model years 1992-2006 unless state regulations already require upgrades to 1992-2006 model years. For a description of truck classes see Oak Ridge National Lab, 2015 Vehicle Technologies Market Report, Chapter 3: Heavy Trucks at 109 *available at* http://cta.ornl.gov/vtmarketreport/pdf/2015_vtmarketreport_full_doc.pdf.

[96] Sean Lyden, *The State of All-Electric Trucks*, Green Fleet, Jan/Feb 2014, 22 *available at* http://zerotruck.com/wp- content/downloads/GRN_medium.pdf.

[97] *See e.g.*, ZeroTruck, *Specs*, http://zerotruck.com/our-fleet/ (last visited Oct. 18, 2016); Smith Electric, *Models and Configurations*, http://www.smithelectric.com/smith-vehicles/models-and-configurations/ (last visited Oct. 18, 2016); Boulder Electric Vehicle, *Models*, http://www.boulderev.com/models.php (last visited Oct. 18, 2016); EVI-USA, *Vehicles*, http://www.evi-usa.com/PRODUCTS/Vehicles.aspx (last visited Oct. 18, 2016).

concept[99] as well as its first fully electric heavy-duty truck.[100] Tesla has similarly indicated its intention to apply its all-electric technology to the heavy-duty truck market.[101] Both companies are focusing on larger Class 7/8 Heavy Duty trucks, meaning that the technology may become available within the ten-year lifespan of the Mitigation Trust.

2. Electric trucks save money compared to their diesel counterparts.

Converting to electric medium trucks makes economic sense. A 2013 study placed the total cost savings of electric versus diesel truck ownership at 22%.[102] That study assumed a cost premium of $25,000 to $37,000 for electric compared to diesel trucks. Notably, since that study was published, battery prices have dropped from $625/kWh, the value used in the study, to under $200/kWh.[103] Because the up-front cost of an electric truck is significantly influenced by the cost of the battery pack, the study likely understates current lifetime cost savings of switching to electric trucks.

Electric delivery trucks also offer significant savings in fuel and maintenance costs as compared to diesel vehicles. Fuel cost savings from switching to electric trucks are tremendous. For example, diesel costs between $2-3 per gallon[104] and "last mile" diesel vehicles are extremely inefficient: the average fuel economy ranges from 4.6 MPG to 9.6 MPG depending on route characteristics.[105] Electricity prices average approximately $1.29 per gallon of diesel equivalent, though prices vary by region and electric utility provider. Electric delivery trucks average between 16.7 MPGe and 34.3 MPGe for those same routes.[106]

These improvements in efficiency add up to significant real world savings in fuel and maintenance costs. EVI estimates that the owner of an electric Class 6 truck should expect to spend only $2,022 per year on electricity while the owner of a similar model diesel vehicle would spend $6,036 on diesel at current prices. Over a projected ten-year lifespan, the cost savings are even greater with an electric vehicle requiring only $17,901 of electricity versus $144,632 spent to fuel a diesel truck.[107]

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[99] Stephen Edelstein, *VW e-Crafter, Mercedes Urban e-truck concept: electric vans for Europe*, Green Car Reports, Sep. 28, 2016 http://www.greencarreports.com/news/1106348_vw-e-crafter-mercedes-urban-e-truck-concept-electric-vans-for-europe.

[100] Danielle Muoio, *Mercedes-Benz just revealed its first fully electric truck*, Business Insider, Sep. 21, 2016 http://www.businessinsider.com/mercedes-electric-urban-truck-photos-2016-9.

[101] Joseph White & Paul Lienert, *Musk 'master plan' expands Tesla into trucks, buses and car sharing*, Jul. 20, 2016 http://www.reuters.com/article/us-tesla-masterplan-idUSKCN1002Q4.

[102] Dong-Yeon Lee, et al., *Electric Urban Delivery Trucks: Energy Use, Greenhouse Gas Emissions, and Cost-Effectiveness*, Environ. Science & Tech. 47, 8022 (2013).

[103] John Voelcker, *Electric-car battery costs: Tesla $190 per kwh for pack, GM $145 for cells*, Green Car Reports, Apr. 28, 2016, http://www.greencarreports.com/news/1103667_electric-car-battery-costs-tesla-190-per-kwh-for- pack-gm-145-for-cells. The decreases have not been as significant for larger electric vehicles which rely on a different battery chemistry than electric passenger vehicles. *See* California Air Resources Board, *Technology Assessment: Medium and Heavy-Duty Battery Electric Trucks and Buses*, Draft, V-3 (Oct. 2015).

[104] Average national price as of October 3, 2016 was $2.389/gallon, but varies greatly with underlying crude oil prices, *see* http://www.eia.gov/petroleum/gasdiesel/.

[105] Electric Urban Delivery Trucks, *supra* note 9 at 8027.

[106] *Id*.

[107] Cost estimates from First Priority GreenFleet assuming national average diesel price of $2.57/gallon and electricity $0.12/kWh.

Electric trucks also save significant maintenance costs over their lifetime. For example, a diesel "last mile" truck registers maintenance costs around $0.22/mile.[108] These costs include oil changes, break repairs, belt replacements, and regular inspections. An electric delivery truck, by contrast, costs only $0.056-$0.111/mile.[109] Electric trucks simply have fewer parts to replace and repair. Additionally, electric drive trains and regenerative breaking reduce wear and tear on remaining parts like brake pads. Because delivery trucks make frequent stops and travel in congested urban areas, brakes are historically one of the most frequent and expensive costs. With electric drive trains break repairs can be reduced by 20-30%.[110]

3. Electric trucks reduce air pollution.

Diesel powered class 4-7 trucks emit, on average, between 4.35 and 7.47 grams of NO_x per mile traveled.[111] Electric vehicles have zero tailpipe emissions. Converting to electricity therefore has a significant impact on local air pollution. Additionally, from a well-to-wheels perspective, electric delivery trucks can reduce greenhouse gas emissions by 27-61%, and they keep improving their environmental performance as our electricity grids get cleaner and cleaner.[112]

Lots of pollution from class 4-7 trucks stems from their unique operational requirements. Many of these vehicles register significant idling times, during which they continue to pollute without any additional vehicle miles traveled. A diesel truck uses between 0.40 and 0.85 gallons of diesel per hour of idling.[113] This costs operators money and contributes to air pollution. To address this issue from long-haul trucks states have electrified truck stops.[114] However, this has not addressed the issue of idling in the local freight and parcel delivery fleets. It is important to address these emissions because they have a tendency to occur in populated urban and suburban settings. Electric vehicles can idle without emitting, and have more efficient start-up/shut-down abilities that may further reduce the need to idle.

4. Mitigation Trust funds can be used to realize the benefits of electric trucks

The life time cost savings from investing in electric trucks means that using Mitigation Trust funds for the up-front cost of these vehicles can actually reduce long-term operating and maintenance expenses, freeing up budget space for additional investment in electric vehicles.

D. Multiplying funds through the DERA Program

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[108] *Id.* at 8025.
[109] *Id*.
[110] *Id.*
[111] U.S. EPA Office of Transportation and Air Quality, *Average In-Use Emissions from Heavy-Duty Trucks*, Oct. 2008, 5 https://www3.epa.gov/otaq/consumer/420f08027.pdf.
[112] Electric Urban Delivery Trucks, *supra* note 9 at 8028-29. This variation depends on the operational characteristics of the diesel truck being replaced. If a diesel truck runs a small route and uses less fuel/day then there are less GHGs to reduce. *Id.*
[113] Oak Ridge National Lab, 2015 Vehicle Technologies Market Report, Chapter 3: Heavy Trucks at 123 *available at* http://cta.ornl.gov/vtmarketreport/pdf/2015_vtmarketreport_full_doc.pdf.
[114] *Id.* at 124.

States have the option to apply for its Volkswagen funding through a partnership with the Federal Diesel Emissions Reductions Act ("DERA"), a program enacted by Congress in 2011 to help reduce diesel engine emissions nationwide. Through this suggested partnership of Volkswagen Settlement and DERA Programming, Connecticut could receive additional funding for electrification of its mobile sector. To achieve this, VW Settlement funds may be used for the DERA Program's voluntary non-federal matching option. Specifically, we encourage Connecticut to apply for program funding through DERA from the EPA, and then use Volkswagen Settlement funds to participate in the DERA voluntary match program. As a result, the EPA will increase their DERA Program funding by an additional 50%.

For example, suppose Connecticut submits a zero-emission transit bus program proposal and receives $200,000 through DERA. If the state matches this amount with $200,000 from VW Settlement funds, the EPA will add a bonus $100,000 to the total program funding. Consequently, Connecticut would receive a total of $500,000 for its zero-emission transit bus proposal, as compared to the initial $200,000.

The goal of eligible DERA programs is to reduce vehicle or vessel NOx emissions, so many of the eligible programs are comparable to those outlined in the VW Settlement. There are some additional programs, however, included in DERA but not included in the Settlement. These include repowering non-road engines (e.g. agricultural irrigation pump engines, bull dozer engines), building up Truck Stop Electrification (or "Electrified Parking Spaces"), and programming for increased Idle Reduction Technology. Ultimately, we support any action that will increase the available funds, so long as the funds are directed towards electrification of Connecticut's mobile source sector.

Thank you for your consideration.

Respectfully submitted,

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Comment #6 – Medicaire, LLC/Medidock

Date Received: 1-3-2017
Name: Frank Podgwaite
Job Title: Manager
Company: Medicaire, LLC/Medidock

Use of Volkswagen settlement funds for Ambulance/Emergency Vehicle Idle Reduction:

Idling of ambulances is a significant contributor to air pollution, particularly as the majority of the idling occurs adjacent to healthcare facilities with their sensitive populations exposed. Reducing this idling provides a direct air quality improvement. Problematic to not idling the ambulance is the fact that interior temperatures and medical equipment must be maintained in a state of readiness, requiring power. My firm's product, the Medidock, provides a real solution to this problem by allowing an ambulance to remain 'mission-ready' without idling.

Our system is a kiosk, installed at Emergency Departments and other medical facilities and at remote locations where ambulances are 'posted' to improve response times and improve air quality. The Medidock requires no special equipment to be installed onboard the vehicle – any & all ambulances can use it. In addition to electrical power for the onboard emergency medical equipment it also provides vehicle interior climate control - without the need to run the engine. Our units ease of operation encourages EMT's to actually use the machines, resulting in fuel and maintenance savings for the vehicle operators and environmental benefits for everyone. On our website www.medicaire.net you will find a study done by the Ozone Transport Commission (OTC) which indicates a significant NOx reduction as noted from sites in VT & NH.

Medidocks are presently successfully operating in northern New England and locations in the Midwest.

While vehicle idle reduction is not specifically indicated in the settlement, augmentation of DERA is, allowing a pathway for funding this important public health/air quality improvement.

I urge you to consider earmarking funding for the Medidock in the final Beneficiary Mitigation Plan. Thank you for your consideration.

Frank Podgwaite
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